

INEEL/EXT-97-01021
(Revision 1)

**The Idaho National Environmental and Engineering Laboratory
A Historical Context and Assessment
Narrative and Inventory**

Prepared for
U.S. Department of Energy Idaho Operations Office

by

The Arrowrock Group, Inc.
Boise, Idaho
Contract K97-557098

September 26, 1997 (Revised November 17, 2003)

TABLE OF CONTENTS

Acknowledgements.	iv
The Arrowrock Group	v
Introduction.	1
 Cross-reference to Proving the Principle.	 12
 Inventory and Survey Results.	 15
 Recommendations	 16
 Historic Contexts Summary	 23
Context I: Prehistoric/Protohistoric	23
Context II: EuroAmerican Contact and Settlement	24
Context III: Ordnance Testing	25
Context IV: Nuclear Reactor Testing	26
Context V: Post Nuclear Reactor Test Research	31
Context VI: Remediation of Waste	31
 Context III: Ordnance Testing	 33
 Context IV: Nuclear Reactor Testing	 43
Preliminary Review of Nuclear Reactors	43
SubTheme: Nuclear Reactor Development.	44
Central Facilities Area	44
Argonne National Lab-West	50
Test Reactor Area	67
Organic Moderated Reactor Experiment.	88
SubTheme: Cold War Weapons and Military	
Naval Reactors Facility	90
Army Reactor Area	97
ARVFS Bunker	107
Test Area North: ANPP	108
SubTheme: Commercial Reactor Safety	
SPERT/PBF Area.	115
Test Area North and SPERT/PBF Area	121
Experimental Dairy Farm	126
SubTheme: Chemical Processing	
Chemical Processing Plant	130
 Context V: Post Nuclear Reactor Test Research	 144
SubTheme: Nuclear Reactor Development	
Central Facilities Area	144
Argonne National Lab-West	146
Test Reactor Area	150
SubTheme: Cold War Weapons and Military	
Auxiliary Reactor Area	151
Naval Reactors Facility	153
Test Area North	155
SubTheme: Chemical Processing	
Chemical Processing Plant	157

Table of Contents, continued

Context VI: Remediation of Waste.164
Radioactive Waste Management Complex164
SPERT/Power Burst Facility176
 Notes on Site Survey and Inventory of Buildings180
Sample Inventory Form189
Inventory of Surveyed Buildings190
Bibliography208
Abbreviations and Acronyms.230

ACKNOWLEDGEMENTS

The Arrowrock Group, Inc., wishes to thank the INEEL employees and former employees who assisted us and extended many courtesies during the conduct of this study. We especially wish to thank Julie Braun, Clayton Marler, Brad Frazee, Joyce Lowman, Cindy Copeland, Riki Nagle, John Horan, Brad Trost, Mike Crane, Teresa Oh, Bernice Kunkel, Brenda Ring Pace, Richard Green, Ren Smith, Dale Teel, Sherri Haskell, Suzanne Miller, Richard Lindsay, Ron Paarmann, Randy Lee, Henry Peterson, Douglas Wood, and Patti Natoni. There were many others, and we thank them all.

Help came from off-site as well: Mona Leon-Guerrero at Naval Construction Battalion, Port Hueneme, California; Gary Weir, Naval Historical Center, Washington, D.C.; Jack Holl, Kansas State University; Richard Martin, University of Illinois Press; Gene Rutledge, former director of Idaho Nuclear Energy Commission; and Joyce Bruce, American Nuclear Society.

The Idaho SHPO staff provided generous consultation in adapting the inventory form and in interpreting National Register preservation formats. Thanks especially to Bert Bedeau, Don Watts, Susie Neitzel, and Belinda Davis.

And Helen Ford, Guila Ford, Jim Hopper, Shirley Rau, Pete Wilson, Kelly Mitchell, Lynna Foster, George Jacox, and Ralph McAdams. Thank you.

Executing the revision in 2003 inspires additional thanks to Hollie Gilbert, contract manager.

THE ARROWROCK GROUP, INC.

The Arrowrock Group, Inc., is a historical consulting firm based in Boise, Idaho. Organized in 1991, the Group consists of four partners, each of whom are historians qualified to conduct historical surveys performed pursuant to Sections 106 and 110 of the National Historic Preservation Act of 1966 (as amended).

Under the direction of the Department of Energy's Idaho Operations Office (NE-ID, formerly known as DOE-ID), Lockheed Martin Idaho Technologies Company (LMITCO) contracted the Arrowrock Group, Inc., on April 4, 1997, to research and write a context report on the history of INEEL, to assess the significance and National Register eligibility of INEEL buildings and structures then under DOE-ID jurisdiction, and to make recommendations for future historic preservation activities that will ensure compliance with historic preservation laws.

The Arrowrock Group submitted a draft of this work on September 25, 1997, to Julie Braun of the LMITCO Cultural Resources Department, technical manager for the contract. Representatives of DOE-ID, LMITCO, and the Idaho State Historic Preservation Office reviewed the draft and suggested several revisions. Upon incorporation of these revisions, Arrowrock sent the report to the Cultural Resources Department in 1998.

In 2003, the Cultural Resources Department, under the management of Bechtel BWXT Idaho, Inc., requested that the report be revised once more, this time to account for significant changes and developments that have taken place at INEEL since 1998 and to update the extant building inventory and historic preservation recommendations.

INTRODUCTION

The Origin of this Study

When summarizing the achievements of the National Reactor Testing Station (NRTS), the Department of Energy (DOE) sometimes notes that 52 nuclear reactors operated at the site, pointing out that this was the largest concentration of such machines ever assembled in one place anywhere in the world. The reactors occupied the site of a former United States Naval Proving Ground (NPG). Most of those reactors served in experiments and tests that have long since been decommissioned or dismantled. Since then, the NRTS has seen changes in its mission and several name changes--to Idaho National Engineering Laboratory (INEL) in 1974, to Idaho National Engineering and Environmental Laboratory (INEEL) in 1997, and to Idaho National Laboratory (INEEL) in 2003. Yet there remains a residual pride in the memory of those 52 reactors.¹

The last reactor built at the site was the Loss-of-Fluid Test Reactor (LOFT), conceived in 1963 and operated for the first time in 1972. As of this report, the Advanced Test Reactor (ATR), the ATR Critical Facility (ATRCF), and Argonne West's Neutron Radiography Reactor (NRAD) are the only three reactors routinely operating. Others are decommissioned, inactive, or awaiting dismantlement. Clearly, the mission to test and operate experimental reactors has drastically declined.

In 2003, the mission of INEEL appears to reach in two directions. A future-oriented research direction is to "enhance energy security through leadership in nuclear science, engineering, and technology development."² The mission is far broader than the laboratory's past concentration on nuclear reactors and their safe operation, but will include the development of Generation IV reactors.³

The second direction reflects the past. The activities at the INEEL site since its inception in 1949 have left buildings, structures, hazards, and wastes of various kinds

¹ A recent example is Lockheed Martin Idaho Technologies Company, *Comprehensive Land Use Plan*, 1996, page 10.

² INEEL, *Strategic Plan* (Idaho Falls: INEEL, 2003), p. 4.

³ INEEL, *Institutional Plan, FY 2002-2006*, p. 68-69. The characteristics of Generation IV reactors are: proliferation-resistant, decreased waste, improved economics, and improved safety.

which may pose a range of threats to environmental and human safety. Eliminating them may involve decontamination, decommissioning, inactivation, remediation, removal, transport, processing, re-use, or some other disposition.

A "cleanup" mandate has existed since at least 1969, but DOE has recently articulated a goal to "accelerate" the cleanup in order to reduce overhead costs and, presumably, risks to the environment and the public.⁴

The INEEL cleanup has been planned largely without reference to the historic significance of targeted buildings, structures, and objects. Nevertheless, INEEL is obliged by federal laws to consider the historic significance of properties being altered or dismantled. Section 106 of the National Historic Preservation Act of 1966 (as amended) requires DOE to consider the impacts their activities will have on historic properties and to allow the Advisory Council on Historic Preservation (ACHP) to comment when such activities will cause adverse impacts. Section 110 requires DOE to establish an interpretation and preservation program to include identification, evaluation of historic significance, nomination to the National Register of Historic Places, and protection of its historic properties.⁵

In view of the conflict between two national-interest goals -- an accelerated "cleanup legacy" and preservation of the "historical legacy" of INEEL -- agreeing upon suitable methods to attain both goals is a somewhat urgent task.

This report is intended to do the following:

- * Present a contextual history of the INEEL

⁴ Environmental regulation comes from National Environmental Policy Act of 1969 (NEPA); Resource Conservation and Restoration Act of 1976 (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); and from numerous other laws, consent orders, and agreements. See also DOE Ten Year Plan, Environmental Management, August 8, 1996; and U.S. Environmental Protection Agency, Region 10; The State of Idaho, Department of Health and Welfare; and the U.S. Department of Energy, Federal Facility Agreement and Consent Order in the Matter of the U.S. Department of Energy Idaho National Engineering Laboratory ("INEL"), Administrative Docket No: 1088-06-29-120, 1991.

⁵ In addition to the Act, see also "Regulations of the Advisory Council on Historic Preservation Governing the Section 106 Review Process," 36 CFR Part 800.

- * Identify any periods of "exceptional significance" that might apply to the INEEL site as a whole
- * Inventory each NE-ID building
- * Assess the historic significance of each building
- * Make general recommendations for historic preservation activities in keeping with DOE's Section 110 responsibilities.

The report is in two sections. The first contains the general recommendations, historic assessments, and context narratives. The second contains a photograph and inventory form for each extant building at the INEEL. The form contains information specific to each building, such as size, description, and relationship to a historic context.

Questions to be Answered

This report is intended to help answer four key questions. The first two are: Do the NPG and/or INEEL properties merit a place among the nation's historically significant properties? If so, what is the contextual basis for this assertion? The NRTS began operations in 1949. Many of its individual activity centers and buildings are less than fifty years old. Federal properties less than fifty years old typically are not eligible for listing on the National Register of Historic Places. However, they may still be eligible under Special Consideration G for "exceptional significance." The NPG is a World War II ordnance test site; its buildings are more than fifty years old. Therefore, it is eligible for consideration. The contracted work includes assessing its historical significance.⁶

The third question considers what actions DOE might take should the INEEL be deemed to house exceptionally significant historic assets. DOE is expected to propose a reasonable approach to interpreting and preserving its contribution to American history. DOE would develop such a proposal in consultation with the SHPO, ACHP, and other key stakeholders. Upon such consultation, plans will be legitimized through a Programmatic Agreement.

In the absence of a such a program to date, proposals

⁶ United States Department of the Interior, National Park Service, Interagency Resources Division, *National Register Bulletin, How to Complete the National Register Registration Form* (Washington, D.C.: U.S. Government Printing Office, 1991), p. 37.

to dismantle or alter a property were handled on a case-by-case basis, typically resulting in a "memorandum of agreement" regarding the documentation of the building. This system has evolved to a more systematic approach. The present inventory, context report, and the incorporation of architectural management planning as part of broader facilities planning efforts are part of this evolution.⁷

Typically, the mitigation option for an "exceptionally" important building was Historic American Building Survey/Historic American Engineering Record (HABS/HAER-level) documentation complete with narrative history and a photographic record (large-format negatives) of architectural and engineering drawings, historic, and pre-dismantlement photos. By the time the building faced dismantlement, the reactor, the instrumentation, or the experiment within the building -- the thing that had been so significant -- had been removed long before. Thus, HABS/HAER-level photos typically documented shells.⁸

In light of this, all parties realized that preserving the historic legacy of the INEEL might take forms other than (or in addition to) HABS/HAER reports. This report recommends several other such preservation activities that DOE should consider as part of a Programmatic Agreement.

The fourth question relates to management: How can the facility inventory forms in this report be used most effectively as management tools to guide the DOE and the SHPO to execute timely and appropriate preservation requirements? The INEEL is a large, functioning, dynamic facility. Historic preservation activities ought not be outpaced by environmental cleanup. In fact, preservation-in-place should be an available option. Early and timely information about historic significance and appropriate preservation should be incorporated in operational plans, appropriately funded, and scheduled in a timely and logical sequence. The standard Idaho State Historic Sites Inventory forms have been adapted with the needs of multiple users at the INEEL and the Idaho SHPO in mind.

In summary, this report proposes a historical context

⁷ Braun, Julie B., *INEEL Historic Architectural Properties Management Plan for U.S. Department of Energy, Idaho Operations Office* (Idaho Falls: Bechtel BWXT Idaho, LLC, Report No. INEEL/EXT-02-1338, Revision 0), p. 3.

⁸ HAER reports were prepared for TAN 629, CPP 633, the ARVFS Bunker, and ARA I, II, III. See bibliography.

for the INEEL, recommends a general preservation program, and supplies a management tool to help with disposition decisions.

Method of Approach

Contract Requirements. During the six-month period in which the building survey and context study were undertaken (April-September 1997), the members of the study team confronted certain limiting conditions in executing the contracted work. First, for safety, security, or schedule reasons, the interior condition of most buildings could not be examined. The hundreds of buildings at INEEL would have made this impractical in any case given the six-month window for the survey. The contract limited the survey to "buildings," which at the INEEL are identified with 600 and 1600 numbers. This meant that "structures," which are identified by 700 or 1700 numbers, were not surveyed. The contracted work also excluded from inventory those properties managed by DOE's Pittsburgh and Chicago field offices. However, the context study was to include those properties -- the Naval Reactors Facility and Argonne West -- and their contributions to the overall history of the INEEL.

Secondary and Primary Literature. Secondary literature on military ordnance and atomic energy research is surprisingly skimpy when it comes to the NPG and the NRTS. Despite the INEEL's long-lasting impact on the state's economy, politics, and cultural life, Idaho and DOE histories (until 2000) neglect the INEEL.

To celebrate the 50th anniversary of the INEEL in 1999, DOE commissioned and published the first general history of the facility. This full-length, illustrated, and documented book, *Proving the Principle, A History of the Idaho National Engineering and Environmental Laboratory, 1949-1999*, by Susan M. Stacy, was researched and published after the 1998 version of this Context Report.⁹ It is a welcome artifact of historic interpretation and preservation to the credit of the DOE and INEEL.

Two years of research, writing, and photo research went into *Proving the Principle*. The author was the project manager for the 1998 version of the Context Report and the

⁹ Susan M. Stacy, *Proving the Principle, A History of the Idaho National Engineering and Environmental Laboratory, 1949-1999* (Idaho Falls: DOE, Idaho Operations Office, 2000).

editor for this revision. The book was a major addition to the secondary literature about the INEEL. With its illustrations, oral history sources, and more penetrating research on many topics than was available for the Context Report, it has substantially aided in the improvement of this revision to the Context Report. The INEEL has made it available on the Internet at www.inel.gov/provingtheprinciple/. For readers' convenience, a table that cross-references this report to appropriate chapters or pages of the book, is supplied at the end of this introduction.

The best source of national "context" for nuclear power continues to be Richard Hewlett's trilogy on the history of the Atomic Energy Commission (AEC). The second book of that series, *Atomic Shield*, provides an excellent basis for understanding the origins of the NRTS. But the third, which covers the Eisenhower years, abandons Idaho almost completely; its index, for example, contains only three entries for "reactor test station."¹⁰

A substantial body of literature discusses broad issues such as nuclear weapons proliferation, commercial reactor safety, and waste processing. Protest literature began to appear in the early 1970s, followed by defensive and "think tank" type literature. Little in this material pertains directly to the NRTS, although it helps define the historic themes that are relevant to the NRTS.¹¹

To develop an INEEL-specific contextual chronology, we consulted INEEL's abundance of primary sources: building history profiles, technical reports, photographs, construction drawings, conference proceedings, and contractor brochures.

Organization. To organize the research into manageable units, we investigated each of the INEEL's major operating centers. Within the INEEL's nearly 890 square miles,

¹⁰ Richard Hewlett and Francis Duncan, *Atomic Shield, 1947-1952, Vol. II of a History of the United States Atomic Energy Commission* (Univ. Park, PA: The Pennsylvania State University Press, 1969); and Richard Hewlett, *Atoms for Peace and War, A History of the Atomic Energy Commission, Vol. III* (Berkeley: Univ. of California Press, 1989), pages 255, 352, and 422.

¹¹ "Protest" literature that chronicles the hazards of nuclear power typically mention the explosive SL-1 accident that killed three men at the NRTS in January 1961.

activities are concentrated at nine official "primary areas."¹² Each primary area is geographically separated from the others by many miles of sagebrush desert, and each has a history distinctly its own, albeit related to the whole. The study narrative reflects this organization, presenting area histories within a chronological framework.

The contracted assignment was to develop a context for the INEEL as a whole, not its parts. Of particular help in doing this was considering the time in which each reactor operated. Realizing that no new reactors (except LOFT) were built after 1970 was invaluable in developing a sitewide chronology, conceptualizing historical themes, and assessing historical significance.¹³

We developed a building typology to help assess each building. Although the NRTS is unique in the world, we still needed to ask, "What would you expect to find at a nuclear reactor test station?" The typology helped to connect a specific building with its historic context, and thus its significance. The typology provided a logical method for sorting out the relative importance, for example, of pumphouses for sanitary sewage systems and pumphouses for sending reactor coolant to a heat exchanger. The building typologies are located in the introduction to the inventory forms and photographs.

As we began this project, we expected to find a great deal of standardization among buildings. For example, we expected that all "guardhouses" might be so similar that, as a mitigation strategy, recording one guardhouse would amount to recording all guardhouses. This proved not to be the case, however. Guardhouses and other buildings were supplied by many different vendors at many different times. Even when they functioned similarly, they were not standardized.

Survey Forms. The inventory used Idaho SHPO's reconnaissance-level site survey form and modified it for this project. Michael "Bert" Bedeau, the Idaho SHPO manager of the National Register program in 1997-98, and other SHPO staff were very interested in the potential management usefulness of the inventory and provided considerable

¹² Idaho Operations Office/DOE, *Comprehensive Facility & Land Use Plan*. Idaho Falls: INEL Report No. DOE/ID-10514, 1996.

¹³ *Proving the Principle* contains an alphabetized list of reactors, with information on operating dates, when these were available.

encouragement and assistance. The modifications created new spaces on the form for data on the size of the building, its typology, and a recommendation for recordation. In 2003, the Idaho SHPO requested removal of the latter.

Recommendation Format. One of the issues considered in this report is an appropriate National Register format for the general recommendations. Should the whole INEEL be thought of as one historic district? Or should each individual primary area be considered on its own? If so, might some areas be significant and others not? Should this be thought of as a multiple property study?

An answer to these questions emerged after the building survey was completed. Officially, we examined buildings only, but it was impossible to ignore the other features and structures on the scene -- the World War II ordnance craters, the cooling towers, the bin sets, the evaporation ponds, the arrays of piping, the exhaust stacks, the waste pits, and the earthen shielding berms. Surrounding all of it was the windy expanse of dry sagebrush desert, with views of mountains, distant buttes, and an occasional antelope. Human enterprise in this specific desert environment made it possible to build nuclear submarine hulls, an airplane hangar (now used to shelter a tank armor factory), below-ground control bunkers for nuclear reactor experiments, an experimental farm, and all of the complex support systems these activities required. Evidence of the mutual impact of people on place and place on people was everywhere.

A format for historical significance comes from *National Register Bulletin 30, Guidelines for Evaluating and Documenting Rural Historic Landscapes*.¹⁴ It seems unlikely that the Bulletin's authors contemplated a highly industrial nuclear testing station in a desert as a "rural" landscape. Nevertheless, their definition applied appropriately to INEEL and its history:

For purposes of the National Register, a rural historic landscape is defined as a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, building and structures, roads and

¹⁴ Linda Flint McClelland, et al. *National Register Bulletin 30, Guidelines for Evaluating and Documenting Rural Historic Landscapes*. (Washington, DC: U.S. Department of the Interior National Park Service, no date.)

waterways, and natural features.¹⁵

Additionally, the four "processes" and seven "components" of historic landscape analysis provide a way to organize present and future information about the INEEL's history. This report, while referencing all of these, documents in detail three of the processes: land use, large-scale patterns of spatial organization, and response to the natural environment. The inventory emphasizes the "building" and "cluster" components of this landscape. Future examinations of this landscape -- and the historical sites and structures within it -- are likely to document processes and components in more detail.¹⁶

Considering the INEEL as a historic landscape illuminates an extraordinary evolutionary connection between succeeding interventions by the federal government on this western desert. In four waves of experimentation, the nation has tried to extend the frontiers of science and engineering. First, it sought to irrigate the desert for agricultural settlement and production. Then it tested the performance of ordnance bunkers, ordnance, and explosives during World War II. Soon after, it created a "testing station" for dozens of nuclear reactor experiments and a chemical processing plant. Having contaminated a natural environment, the government's fourth wave of experiment seeks to remediate it. Future historians may name a fifth wave once they have had time to examine the meaning of the 21st Century mission to "enhance energy security."

The government itself recognized the mutual impact of human activity and the desert environment. In 1975 it declared the INEEL a National Environmental Research Park for the purpose of examining that impact scientifically.¹⁷

The "historic landscape" concept allows for a holistic interpretation of the built environment at INEEL. A given building is invariably part of a system of buildings -- a

¹⁵ *Bulletin 30*, p. 2.

¹⁶ Processes: land uses and activities, patterns of spatial organization, response to the natural environment, cultural traditions; components: circulation networks; boundary demarcations; vegetation related to land use; buildings, structures and objects; clusters; archeological sites; small-scale elements. See *Bulletin 30*, p. 4-6.

¹⁷ INEL, *Comprehensive Facility and Land Use Plan* (Idaho Falls: DOE/ID Report No. 10514, March 1996), p. 50.

complex of supportive and auxiliary functions that were situated where they were for highly specific reasons related to the environment, to the needs of an experiment, to human safety, or to government directives for economy. The recommendations for historic preservation and mitigation take this into account.

Period of Significance and SubThemes: Certain themes dominated INEEL history during discrete periods of time. This report refers to these periods as "contexts." Each context has a name, subthemes (in some cases), and begin/end dates. As will be discussed in more detail below and in the narrative report, the historical analysis concluded that the history of the INEEL site after 1942 falls into four "contexts." (Previous analysis by others has identified and named two "contexts" previous to these four. These are addressed briefly in the report.)

Evaluating the contexts for their historic significance was the key reason for this project. Upon this evaluation hangs the assessment of any given building constructed during that period of time. Of the four post-1942 contexts, two are assessed as historically significant: the "Ordnance Testing" and "Nuclear Reactor Testing" contexts, whose dates are 1942-1949 and 1949-1970 respectively. The last two contexts are "Multi-Program Research" and "Remediation of Waste." These two overlap conceptually to some extent, but they have the same dates: 1971-present. Neither is assessed as historically or "exceptionally" significant. The activities are still evolving and it is too soon to evaluate their importance.

The context period for Ordnance Testing involved two different wars, so it identifies SubThemes related to either World War II or the Vietnam War.

The many and varied activities related to Nuclear Reactor Testing are also categorized in SubThemes. These major national concepts help describe the vast history of the Age of Nuclear Technology in the United States.¹⁸ The INEEL is very much a part of these national themes:

- Nuclear reactor testing, experimentation, and development
- Cold War weapons and military applications
- Commercial reactor safety
- Chemical Reprocessing (of spent fuel to recover

¹⁸ The term "testing" in this report must not be understood as the detonation of nuclear weapons devices.

uranium)

The context periods for Multi-Program Research and Remediation of Waste have been given no SubThemes.

CROSS REFERENCE TABLE
The Context Report and Proving the Principle

Contexts 1 and 2	Ch. 1: Aviator's Cave
Context 3, Naval Proving Ground	Ch. 2: The Naval Proving Ground
Context 4: National context for reactor research	Ch. 3: Uranium Trail Leads to Idaho
Transition from NPC to AEC	Ch. 5: Inventing the Test Station
Argonne National Lab	Ch. 3: Uranium Trail Leads to Idaho
EBR-I reactor	Ch. 6: Fast Flux, p. 44-48 Ch. 8: Reactor Zoo, p. 64-66 Ch. 14: Imagining the Worst, p. 135-136 Ch. 17: Science in the Desert, p. 165 Ch. 20: A Question of Mission, p. 192
Test Reactor Area, MTR	Ch. 6: High Flux, p. 48-51 Ch. 8: Reactor Zoo, p. 66-69 Ch. 17: Science in the Desert, p. 162 Ch. 20: A Question of Mission, p. 194-196
Nautilus prototype	Ch. 6: Rickover Flux, p. 51-53 Ch. 8: Reactor Zoo, p. 69-73.
Test Reactor Area, ETR	Ch. 12: Reactors Beget Reactors Ch. 17: Science in the Desert, p. 160-
OMRE	Ch. 17: Science in the Desert, p. 163
Naval Reactors Facility	Ch. 10: Cores and Competencies
Idaho Chemical Processing Plant	Ch. 11: The Chem Plant Ch. 17: Science in the Desert, p. 169-172
Test Area North	Ch. 13: The Triumph of

	Political Gravity over Nuclear Flight Ch. 17: Science in the Desert, p. 164-165
Argonne's BORAX experiments	Ch. 14: Imagining the Worst, p. 128-133
SPERT experiments	Ch. 14: Imagining the Worst, p. 133-134
EBR-2 and Fuel Recycling	Ch. 14: Imagining the Worst, p. 136-137 Ch. 17: Science in the Desert, p. 165-166
Army Reactor Area	Ch. 15: The SL-1 Reactor Ch. 15: The Aftermath
Test Reactor Area, ATR	Ch. 17: Science in the Desert, p. 160-162
Dairy Farm	Ch. 17: Science in the Desert, p. 167-169
Argonne and LMFB	Ch. 18: The Shaw Effect, p. 174-176 Ch. 19: ...And the Idaho Boost, p. 184-188 Ch. 23: The Endowment of Uranium, p. 231-232
Safety Test Program and LOFT reactor, PBF	Ch. 18: The Shaw Effect, p. 177-183 Ch. 23: The Endowment of Uranium, p. 222-226
Context V, and National Change of Attitude re nuclear power after 1970	Ch. 20: A Question of Mission Ch. 21: By the End of this Decade Ch. 23: The Endowment of Uranium, p. 231-32
Context V, Multi-Program Research	Ch. 22: Jumping the Fence
Context V, the IFR	Ch. 23: The Endowment of Uranium, p. 232-238
Context V, the SMC	Ch. 23: The Endowment of Uranium, p. 228
Context V, Chem Plant (INTEC)	Ch. 23: The Endowment of Uranium, p. 229

Context V, the IRC	Ch. 25: Mission: Future, p. 247-255
Context VI, Remediation of Waste	Ch. 9: Hot Stuff Ch. 20: A Question of Mission, p. 197-204 Ch. 21: By the End of this Decade Ch. 22: Jumping the Fence, p. 219-221 Ch. 24: The Uranium Trail Fades, p. 238-244 Ch. 25: Mission: Future, p. 244-247
Glossary of Terms	p. 307-312
List of INEEL reactors	p. 259-268

INVENTORY AND SURVEY RESULTS

The survey of buildings in the following INEEL site areas resulted in inventory forms for 468 buildings. This total may not match the number of inventory forms because some buildings joined together at one wall are regarded as two buildings, each with its own number. Some of these were described on one inventory form. Likewise, identical sets of buildings were described on one form.

* Sitewide (B)	21
Army Reactor Area (ARA)	1
Central Facilities Area (CFA)	71
Idaho Chemical Processing Plant (ICPP)	138
(named INTEC since 1999)	
Experimental Breeder Reactor-I (EBR-I)	2
Power Burst Facility (PER)	26
Test Area North (TAN)	76
Test Reactor Area (TRA)	87
Radioactive Waste Management Complex (WMF)	44
Howe Peak	1
East Butte	1

* "Sitewide" is a term used at the INEEL to describe areas outside the primary activity areas. This group includes guardhouses at INEEL entry stations, for example.

The oldest extant building dates from 1942. The newest were built in 2003. The distribution of buildings by decade is:

1942-1949:	12
1950-1960:	128
1961-1970:	49
1971-1980:	54
1981-1990:	127
1991-2000:	94
2001-2003:	4

The distribution of buildings by the assessment of their historical significance and within their appropriate (or earliest) historical context is:

Context III	Ordnance Testing:	12*
Context IV	Nuclear Reactor Testing:	175
Context V	Multi-Program Research	230
Context VI	Remediation of Waste:	51

Some Context III buildings are also associated with Contexts IV and V.

RECOMMENDATIONS

Summary Statement of Significance. The context narrative suggests the following conclusion regarding the significance of the INEEL: The INEEL was associated with events during the period between 1942 and 1970 that have made a significant contribution to the broad patterns of American history, particularly with respect to its association with World War II and, thereafter, with (nuclear) Science and Engineering. The facilities at the INEEL associated with these themes are of exceptional significance.

Section 106 Recommendations. The following recommendations are intended to assist NE-ID meet Section 106 and 110 responsibilities.

1. *Landmarks.* If a building has been identified as of "exceptional significance" and is of National Landmark potential, the recommendation is that it be preserved in place and maintained in appropriate condition for historic interpretation to the benefit of the public and future generations.
2. *Reactors.* Any building that housed a reactor or a significant process, such as the Materials Test Reactor, the Fuel Processing Building at the Chemical Processing Plant (INTEC), and Experimental Organic Cooled Reactor, for example; and was constructed during the historic period of significance or is exceptionally significant (ie, LOFT) should form the key property in a HABS/HAER study.

HABS/HAER documentation should record the key reactor building and the cluster of support facilities that surrounded and supported it. For example, a reactor building might have been supported by a stack, ventilator building, coolant water process buildings, cooling tower, hot shop, and others. A HABS/HAER report provides a useful way to bring together the abundant historical documentation scattered about the INEEL: construction progress, aerial, and interior photographs; architectural, engineering, and process drawings; and reports. While HABS/HAER reports are not required to be "definitive" histories, they are opportunities to build *dossiers* on facilities that will be useful to future researchers.

HABS/HAER reports should be undertaken for all landmark properties and associated programs and support structures.

3. *Reactor Support.* If a building that was an intimate

component of a reactor or process complex (fuel element storage, plug storage, heat exchanger, cooling tower, hot shop, for example), it should be photographed with large-format archivally processed black/white film. The photographs should be preserved along with historic photographs and drawings. When a HABS/HAER report is undertaken for the key building in the complex, these photographs and other documents will become part of it. This procedure should allow the objectives of cleanup and preservation to progress together.

4. *Reactor Support Auxiliary*. If a building was a contributing feature of a historic complex, but not immediately essential to the experiment (sewer pumphouse, cafeteria, bunkhouse, warehouse), its contribution to the complex would be best captured in historic photographs collected as part of a broader HABS/HAER study.

5. *Reassessment*. Buildings should, in general, be allowed to reach fifty years of age before their importance in American history is assumed. However, buildings of lesser age may reasonably be re-assessed for their potential as "exceptionally" significant properties from time to time.

Section 110 Recommendations. In the early 1990s, a dispute erupted between the National Park Service and the National Aeronautics and Space Administration over the disposition of twenty-five Man in Space properties. Subsequently, the Advisory Council on Historic Preservation produced a report entitled *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities*.¹⁹ Without a doubt, the INEEL is a highly scientific facility where scientific boundaries were moved forward. And without a doubt, the demands of continuing operations sometimes conflict with the goal of preserving and conveying to the public its historic legacy.

The *Balancing* report reminded everyone that the object of historic preservation is to connect the citizens of the country to their heritage. The preparation of HABS/HAER reports alone (followed by dismantlement) is hardly likely to reach the potential audience of interest. The Council listed several suggestions and invited scientific agencies to be innovative.

¹⁹ Advisory Council on Historic Preservation, *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities* (Washington, D.C.: ACHP, 1991).

We recommend that DOE embark on a proactive program of historic preservation and interpretation. This program should be encased in a Programmatic Agreement, with identified milestones and funding provided. The following activities should be included.

1. National Historic Landmarks. The scope of this study did not include a detailed evaluation of potential candidates for National Historic Landmarks. Such analysis should be undertaken and needs to include an assessment of the proposed landmark's integrity and should be done with cognizance of other nuclear-research-related landmarks in the country. At the INEEL, only the Experimental Breeder Reactor I (EBR-I) has been named a National Historic Landmark.

The American Nuclear Society (ANS) conducts a landmark program to recognize facilities of significance to the history of nuclear science. It has awarded its "Landmark Award" to several INEEL sites: to EBR-I, Experimental Breeder Reactor II, the Old Waste Calcining Facility, the nuclear submarine prototype S1W, Special Power Excursion Reactor Tests I-IV (SPERT I-IV), and Materials Test Reactor (MTR). These facilities and the Engineering Test Reactor (ETR), the Aircraft Nuclear Propulsion Program (ANP), and the Loss-of-Fluid Test (LOFT) should also be evaluated for National Historic Landmark status.

A significant feature of INEEL history is its singular nature as a nuclear "proving ground" and the wide-ranging activities that took place here. Any landmark program should be flexible enough to commemorate not only individual buildings (as was done at EBR-I) but the testing station as a whole.

2. HABS/HAER Reports. A systematic program of HABS/HAER reports should be undertaken for the following areas or facilities:

- U.S. Naval Proving Ground (1942-1949)
- Test Reactor Area (TRA)
- SPERT I-IV and the Power Burst Facility (PBF)
- Idaho Chemical Processing Plant (ICPP, INTEC)
- Experimental Organic Cooled Reactor (EOCR)
- Naval Ship Reactors
- Argonne National Laboratory West (ANL-West)
- ANP/LOFT (to supplement HAER No. ID-32-A, TAN Hangar)

The reports should center upon a key area, experiment, or process. All auxiliary buildings, structures, and artifacts should be included. Auxiliary buildings should not

be the center of any HABS/HAER reports.

The buildings at the INEEL are frequently less interesting than the activities they housed. HABS/HAER reports should be regarded as an opportunity to mine the INEEL archives for historic photos documenting the processes and experiments that took place within the buildings as well as their special construction and architecture. The nature of scientific research was to recycle buildings and equipment, so historic photographs should be used to preserve the legacy of that work. Archival aerial photographs and technical reports also can help document the interaction between science and the landscape.

Pursuant to Section 106 of the National Historic Preservation Act, HAER reports have been completed for the following: ANP Hangar (TAN-629), the Advanced Reentry Vehicle Fuzing System (ARVFS) Bunker, the Old Waste Calcining Facility (ICPP-633), and Army Reactor Areas I, -II, -III, and -IV.

3. Preservation of Archival Material. The INEEL Photo Lab maintains a collection of an estimated one million negatives. Original engineering drawings may be available. The INEEL Technical Library houses the reports and journals in which scientific findings were published. Motion picture films and videotapes also exist on the INEEL site. All of this material can not all be preserved via a HABS/HAER report, but together they are irreplaceable documents recording the history of the INEEL.

Some of this material has been discarded after it has served the technical needs of scientific researchers. However, we recommend that the material be considered an archival collection with great historical value, and that it be preserved, managed, stored, and used accordingly.

4. Preservation of Artifacts. We recommend that a group of scientists and engineers form a committee to consider what artifacts, structures, and objects will help preserve and convey the historic legacy of scientific research to future generations. Such articles should be preserved for use in a museum or special (permanent) exhibits. Examples might include control panels, robots, unique fabrications (like the dolly that transferred HTRE experiments to their test site and back), shielded locomotive, instrumentation, older and newer generations of analytical equipment, cadmium rabbits, grappling tools, friskers, (unirradiated) fuel elements, metal-toed boots, dosimeter badges and detection equipment, transport casks, straddle carriers, and scale models of facilities.

Upon identification, such objects should systematically be collected, stored, and protected until they are permanently installed in a museum, exhibit, or otherwise preserved.

5. Exhibits. Having preserved artifacts, the next issue is to consider the setting in which they might best contribute to the larger understanding of the INEEL: In an expanded museum near EBR-1? In connection with another landmark-status reactor building? Perhaps in the Experimental Organic Cooled Reactor that was built but never went critical? Perhaps a combination museum/surround-sound theater in Idaho Falls would provide a better opportunity, or when appropriate, interactive traveling exhibits that could visit school science classes and similar locations.

6. Oral Histories. Present and retired INEEL employees are the most compelling source of information (sometimes the only source) about "why we did this," or what it was like "to be there." For every \$200,000 budgeted for the remediation of a site or dismantlement of a building, an amount (such as .5 percent) could be placed in a fund for an Oral History program. The money would finance a professional program of travel, interview, recordation, and transcription of a wide range of INEEL workers.

7. Written Histories. The research conducted for HABS/HAER reports should be used in other formats to help interpret INEEL history to various audiences. Possibly HABS/HAER reports should be published in quantity and distributed to public libraries. Commemorative books for special occasions could exploit the photographic archive to help tell the story of science, of research, atomic power, of nuclear engineering, or of environmental impacts. Fellowships might be financed to invite and encourage historians to use the archival resources at the site for research projects. The book *Proving the Principle* should be made available for the general public. Additional books interpreting INEEL history could be commissioned.

8. Re-use, an Alternative to Dismantlement of Historic Buildings: Although present DOE priorities are to reduce costs associated with maintaining idle resources, it is recommended that alternatives to dismantlement be considered in the case of historic buildings. Re-use, postponement of dismantlement, or stabilization and closing might extend the life of a facility and make it available for future mission needs or historic interpretation to future generations.

One possible strategy to preserve a historic structure

is to re-use it without destroying its historic integrity. This strategy should be applied discriminately at INEEL. Scientists designing the next experiment are notorious for "re-using" everything from vacant buildings to materials and tools that someone else abandoned. In some cases, re-use will preserve a historic structure; in others, re-use obliterates the interior features that made a building historically interesting.

One example of re-use that preserved a historically significant building is at Test Area North, where a tank armor manufacturing plant was erected under the barrel-vaulted ceiling of an airplane hangar designed to house a nuclear-powered jet airplane. The shape and size of the hangar were unaffected by the new use (although repairs to the leaky roof threatened to change its appearance). Inside, the armor plant left in place the one feature that related to the hangar -- a lead brick docking structure intended for the airplane.

More typically, re-use occurs when the rectangular shell of a building is gutted of its former laboratory configuration and equipment, de-contaminated, and re-occupied by another type of activity altogether. All trace of the historically significant activity is gone, while the building shell lives on, meaningless for any historical interpretation except "It used to be in this building." Re-use of this type occurred at the Army Reactors Area where the shell of a (swimming-pool-type) reactor building was cleaned up and re-used for offices.

Historic re-use is sometimes uniquely interesting. For example, the ammo-storage bunkers built at the Naval Proving Ground (Central Facilities Area) were built before nuclear fallout had made its appearance on Earth. When later radiologists sought a place with low background radiation for their laboratories, they selected these bunkers and adapted them.

The challenge for historic preservation is to evaluate the relationship between an architectural envelope and the activities occurring inside. The architecture of a hangar or a domed reactor building relates to the purpose of the experiment for which it was designed. A standard rectangular building intended as an economical shelter from the weather carries far less meaning. Failing to distinguish between the two situations can result in misplaced preservation priorities.

Re-using an empty building shell in the name of "historic preservation" is pointless. Future generations

would be better served if artifacts, scale models, measuring devices, films, photographs, oral interviews, histories, and documents related to the experiments are preserved and interpreted for public access.

Summary of Building Recommendations.

The table below summarizes the status suggested for 433 buildings inventoried at the INEEL. All buildings constructed between 1942 and 1970 are eligible for consideration to the National Register of Historic Places.

Area	No. of bldgs	Eligible for Nat Reg
Site	23	5
CFA	74	39
ICPP (INTEC)	130	23
EBR-I	2	2 *
PER	22	12
RWMC	48	0
TAN	58	27
TRA	76	59

* EBR-1 is a National Historic Landmark and is regulated according to 36 CFR Part 65.

HISTORIC CONTEXTS AND CHRONOLOGY
A Summary Assessment of Significance

The body of knowledge accumulated about the 890 square-mile geographic landscape area known as the Idaho National Laboratory in Southeast Idaho can be organized into six (slightly overlapping) contextual periods. This report does not assess the significance of context periods preceding 1942, but they are summarized here for the reader's convenience.

- | | |
|--|--------------------------|
| I. Prehistoric/Protohistoric | 15,000 B.P. to 1805 A.D. |
| II. EuroAmerican Contact and Settlement | 1805 to 1942 |
| III. Ordnance Testing | |
| A. World War II: U.S. Naval Proving Ground | 1942 to 1949 |
| B. Vietnam War | 1968 to 1970 |
| IV. Nuclear Reactor Testing | 1949 to 1970 |
| V. Multi-Program Research | 1971 to pres |
| IV. Remediation of Nuclear Waste | 1971 to pres |

Context I: Prehistoric/Protohistoric: 15,000 B.P. to 1805 A.D.

Archaeological investigation on and near the borders of the INEEL has indicated the presence of early peoples at hunting sites and shelters as long ago as 12,000 years. The lava plain was populated by mastodons, giant bison, camels, and saber-toothed tigers, all of which attracted hunters. Water, small animals, useful plants, minerals, and obsidian for spear points also drew people to the area.

From about 8,000 years ago, small bands of people crossed over the land in an annual cycle, gathering plant resources in season and traveling between stone quarries, fishing areas, and other supply areas. Archaeologists continue to gather information about early human life in the area, noting rock paintings, animal and human bones, occupational sites, and the changing styles of projectile points. This lengthy context period is further subdivided into a more detailed chronology dividing the period into Early (15,000-7500 B.P.), Middle (7400-1300 B.P.), Late (1300-150 B.P.), and Protohistoric (300-150 B.P.). The latter period was characterized by the presence of European trade goods and the introduction of horses.

A summary description of this context period and a comprehensive bibliography can be found in *Idaho National Engineering Laboratory Management Plan for Cultural Resources* (Final Draft) by Suzanne J. Miller.²⁰

Context II: EuroAmerican Contact and Settlement: 1805-1942

The period of EuroAmerican contact in Idaho is generally considered to begin in 1805 with the Lewis and Clark Expedition. The first EuroAmericans to have entered the INEEL territory most likely were French-Canadian trappers and other explorers, perhaps around 1820. U.S. Army Captain B.L.E. Bonneville traversed the area in 1832-33 and referred to it as the "plain of the Three Buttes."²¹ Explorers and trappers in the vicinity of the INEEL would have met Shoshone and Bannock peoples gathering plants or hunting.

Large numbers of emigrants followed the Oregon Trail through Idaho beginning in the 1840s. A shortcut known as Goodale's Cutoff was established in the early 1850s; its traces are still visible in the southwestern corner of the INEEL. Later this trail was used when cowboys drove great herds of cattle across the plain from Idaho, Washington, and Oregon to Wyoming. Sheep drives replaced cattle in the 1880s.²²

Two stagecoach lines crossed the area near Twin Buttes, near the southern boundary of what became the INEEL. Transportation became more reliable through the area after freighters began serving miners in the mountain camps north and west of the INEEL. Cattlemen established ranches along the Little Lost River and Birch Creek in the early 1880s. Homesteaders settled in the Big Lost River area in the late 1870s and began the daunting task of farming arid lands.

The federal government became involved in the effort to irrigate arid lands when Congress passed the Carey Act in

²⁰ The report, published by INEL Lockheed Idaho Technologies Company, was prepared in July 1995 as Report No. DOE/ID-10361.

²¹ Washington Irving, *Adventures of Captain Bonneville* (Portland, Oregon: Binford and Mort, no date, Klickitat Edition), p. 110.

²² See Miller, p. 2-19 for a map of historic trails crossing the INEEL.

1894, followed by the Reclamation Act in 1902. These laws provided land and financing for water storage and distribution projects. This federal action might be said to constitute its first "test" in reshaping the landscape at the INEEL. The Big Lost River Irrigation Project included two large tracts of land, one in the south-central portion of the present INEEL. This experiment in settlement and irrigation ultimately failed. The engineers miscalculated the available water and had a poor understanding of the soils and porous basalt layers that underlay their reservoirs and canals. Settlers drifted away in the 1920s, having failed to find "salvation from the application of science and engineering expertise" for their project, leaving the land once more very sparsely populated, and having brought no large town to the environs of the INEEL.²³

Considerable historical research has illuminated this context period and provided benchmark dates that mark a more detailed chronology. Historic themes include early exploration and discovery, trapping and trading, the Oregon Trail, mining, cattle and sheep drives, transportation, EuroAmerican/Native American relations, settlement, irrigation, and ranching.²⁴

Context III: Ordnance Testing: 1942-1949 and 1968-1970

This context is divided into two periods. The first related to World War II, extending from 1942 to 1949. When the Navy established an ordnance plant in Pocatello, Idaho, to manufacture, repair, and assemble components for large naval guns, it required a place to proof-fire the gun components.

The isolation of the site and its sparse human population made it suitable for the Navy's purposes. The land was arid, flat, and mostly in the public domain. The Navy built a residential and proof area at the site and conducted proof operations and explosives experiments during and after the war. A history of this "test" period is contained in Chapter 2 of *Proving the Principle*.

²³ Hugh Lovin, "Footnote to History: 'The Reservoir Would Not Hold Water,'" *Idaho Yesterdays* (Spring 1980), p. 14. Lovin's remarks referred to the Blaine County Irrigation Project, which lies northeast of Howe in Butte County.

²⁴ These themes are introduced in Miller, p. 2-18 to 2-21, and supported by an excellent bibliography.

When the Atomic Energy Commission (AEC) selected the site for its National Reactor Test Station (NRTS), the Navy buildings remained, but Navy personnel departed. The practice of explosives experimentation ended. However, during the Vietnam War, the site was again used for U.S. Navy ordnance experiments and related target practice. Gun mounts were aimed away from new buildings and targeted towards the Big Southern Butte.

The present study begins with this context period and supplies a summary narrative historic overview. It relates to the national historic context of World War II: the Home Front, the U.S. Navy, gunnery, ordnance manufacture and testing, and explosives research. As one of the few sites of its type, this report has identified the World War II ordnance testing context as historically significant.

Context IV: Nuclear Reactor Testing: 1949-1970

The AEC selected the site for its reactor test station for reasons similar to those that had attracted the Navy -- isolation and safety. In order to prevent exposing large populations of people to the possible consequences of an accidental release of radiation, it established a test station that could be used by any of several national laboratories to construct experiments and test new reactor concepts. Of equal importance was its supply of underground water. Landscape features such as wind patterns, average temperatures, and subsurface layers of lava rock became important in siting and operational decisions.

The AEC concept for managing the testing station was to supply a series of central services, so that the laboratories or other contractors could set up their tests as economically and expeditiously as possible. The existing Navy buildings were used as a central supply and administrative area. To this core, additional buildings were added as the NRTS grew. NRTS managers situated the reactor experiments at specified safety distances from the central area and from each other.²⁵

The three main objectives of the AEC nuclear reactor

²⁵ John Horan, former director of Health Physics at INEL, understood that a rough "rule of thumb" of about five miles guided the separation of reactors from populated areas and each other. These were revised after the development of the Shippingport reactor in Pennsylvania. Interview with author, July 29, 1997.

program were: to develop a supply of nuclear materials for national defense, to develop knowledge about nuclear reactor concepts, and to establish safe operating parameters for reactor safety and human health. As has been well documented by Richard Hewlett and the other authors of *Atomic Shield* and *Atoms for Peace and War*, the Cold War and the race for nuclear weapons supremacy between the United States and the Soviet Union consumed substantial AEC energies and resources. Significant weapons system development took place at the NRTS, particularly by the Navy and Air Force. The Army likewise was active at the site, not in pursuit of a weapons system, but of a nuclear alternative to diesel generators and fuel supply lines for field bases.

Despite the heavy investment in military activities, other AEC program goals were in abundant evidence at the site. Several experimental reactor concepts were tested, the first being EBR-I. Other concepts tested included gas-cooled reactors (as part of the Army's program), an advanced breeder reactor, and organic moderated reactors.

Reactor safety experiments also began early at the site with the Boiling Water Reactor Experiments (BORAX) and Special Power Excursion Reactor Test Program (SPERT). Environmental monitoring was an early and continuous activity. The program included an experimental farm and the regular monitoring of soil, groundwater, and waste streams.

In the 1940s and 1950s, the AEC thought that uranium, the raw material for reactor fuel, was a relatively scarce element on the earth. It therefore had to husband its supply with great care. Test reactors and plutonium-producing reactors used highly enriched uranium fuel that lost its reactivity in a reactor over a period of 17 to 18 days of operation, leaving 80 percent or more of the fuel unfissioned. This situation dictated the practice of recovering uranium from spent reactor fuel. At the NRTS the Chemical Processing Plant recovered uranium from the test reactors on the site and from fuel shipped from many other places.

After reviewing the history of each of the "primary areas" at the INEEL, the authors of this report have concluded that all of its early activities with nuclear reactor experiments fell into one of the following historic SubThemes:

- * Cold War weapons and military applications
- * Nuclear reactor testing, experimentation, and development
- * Commercial reactor safety (environmental and human)

* Chemical Reprocessing (of spent fuel)

The narratives in this study are therefore identified according to these themes. A new Atomic Energy Act was passed in 1954 to permit (among other purposes) the commercial use of nuclear material. After 1954, nuclear reactor testing was a growing enterprise.

Beginning in 1971, the thematic continuity of "nuclear reactor testing" began to break down. By that time, most of the 52 reactors had been built, served their experimental purpose, and been dismantled or destroyed. In the case of military experimentation, the Army program had taken place from 1957 to 1965; further research was canceled at that time. The Air Force project to build a nuclear-powered turbo-jet bomber had been canceled by President John F. Kennedy in 1961. The Navy's drive to create a nuclear-powered fleet of submarines and surface ships, on the other hand, had already succeeded. While research continued on how to improve the payoff for using nuclear reactors in ships (such as fitting large ships with two or more reactors), the thrust of the Navy mission shifted to the enhancement of proven concepts and to the training of sailors to operate nuclear-powered ships.

After 1970 the AEC's reactor development program of experimenting with new or advanced reactor concepts no longer involved the construction of new reactors at the NRTS. The AEC placed its faith in the development of a major breeder reactor to be built at Clinch River, Tennessee, a project that ultimately failed.

The only new reactor to appear at the NRTS (other than the placement of new cores in existing reactor facilities) after 1970 was connected with the Loss-of-Fluid Test (LOFT) program. This important reactor safety program originated in the early 1960s. A commercial nuclear power industry was growing fast, and great interest focused on the safety of scaled-up power reactors. One of the worst accidents that was imagined was for a large reactor to experience a loss of coolant fluid to its core, heat up, and melt down. After several redefinitions of the "loss of fluid" problem and redirection of the program, the LOFT reactor reached its first criticality late in 1972.

Without doubt, the "nuclear reactor testing" context at the NRTS is of national significance in American nuclear history. Hewlett, in *Atomic Shield*, shows that the decision to establish the NRTS helped break a certain AEC malaise and get the reactor program off the ground. The NRTS was the only place in the world of its kind, and the tests conducted

there were of consequence in the evolution both of weapons programs (ie, nuclear-powered submarines and bombers) and of the commercial atomic industry. The narratives that follow will examine these contributions in more detail.

Equally without doubt, this era is of great historical significance to the State of Idaho. Soon after its establishment, the NRTS was the single largest employer in the state and remained so until very recent years. The federal investment in personnel and physical plant has been substantial. People from all over the country entered Idaho and changed it permanently.

It was easy to define the beginning date of the NRTS's historical significance (for the purpose of this report) as 1949, but defining its end date was more challenging. Reactor research continues at the INEEL to the present day; a few reactors continue to run. Given the fact that the historic mission of the site was to perform reactor tests, this study chose the year in which this mission was no longer on an upward trajectory, but rather moving downward. Based on evidence from within the INEEL and from the national scene, that break occurred between 1970 and 1971.

The evidence from within INEEL is summarized by considering the operating years of the NRTS reactors. With one important exception (LOFT), no new reactors appeared at the site after 1970. In 1970 the Materials Test Reactor shut down; significantly, this was after a failed attempt by commercial and academic interests to finance continued nuclear research there.

The nation as a whole was beginning a turn away from further nuclear research and the potential of nuclear energy. The many complex reasons for this were becoming evident in 1971:

The National Environmental Policy Act of 1969 (NEPA) had been signed by President Richard Nixon on the first day of 1970. The Environmental Movement -- a perception by American citizens that hazardous contamination of air, soil, and water must be reversed and prevented -- had reached this first major legislative watershed. In its wake came other laws that affected how government, business, and industry would operate. In 1971, a federal court ruled that the AEC must abide by the rules of NEPA. Nuclear energy fell into the net of the environmental movement.

In 1971 President Richard Nixon articulated the nation's first National Energy Policy. He made it clear that the AEC's broad inquiry into many different reactor concepts

had come to an end. He singled out one reactor type for further research--the breeder reactor. Nixon said that breeder reactors were "our best hope today for meeting the nation's growing demand for economical, clean energy..." But also in 1971 the fuel in the Enrico Fermi breeder reactor, a demonstration project jointly developed by commercial interests and the AEC near Detroit, Michigan, became depleted. The facility soon closed and the reactor never ran again.

In 1971 the price of energy, which had been declining throughout most of the century, leveled off and began to rise. In 1971 the AEC, which had up to this year always estimated an energy future in which nuclear power provided a growing share of electricity, revised its forecast downward for the first time.

The decline of nuclear reactor research continued into the 1970s. In 1971 the estimated cost of the Clinch River breeder reactor rose dramatically. The project was to be a partnership between the AEC and private utility companies. The contract among these parties came together in 1971, but the utility companies lacked confidence in it. They demanded that the federal government pay for any cost overruns that might be incurred. Congress agreed to this the next year, but the project failed to thrive.

In 1972, at West Valley, New York, where the AEC had encouraged and subsidized the establishment of a commercial reprocessing plant to handle spent fuel from commercial power reactors, the plant shut down after failing to make a profit for each of its six years of existence. The private market had failed to establish an essential element of the nuclear power industry -- the processing of spent fuel.

In October 1973 the oil producing nations of the Middle East embargoed the shipment of oil to the United States. Some people thought this might be an opportunity to cast nuclear technology as the path to American energy independence. But the public responded to rising energy prices by reducing its demand. Utility companies now had proof that American demand for energy was elastic in the face of rising prices. The cost of bringing new power plants on line continued to rise, and utility companies began to fear the possible consequences of such rising costs.

In 1974 the AEC was reorganized into two agencies, the Nuclear Regulatory Commission (NRC) to regulate the nuclear industry and the Energy Research and Development Administration (ERDA) to formulate energy policy. All orders placed for nuclear power plants after 1974 were subsequently

canceled.

And so it went. In 1979 an accident at the nuclear power plant located at Three Mile Island, Pennsylvania, and the publicity which followed, convinced large numbers of citizens that nuclear power was not worth the risk. A constituency fearful of nuclear weapons proliferation successfully challenged the old idea that the uranium and plutonium in spent fuel should be recovered and recycled. Congress finally killed the funding for the Clinch River breeder reactor in 1983. Another major physics research project, a Supercolliding Superconductor, was canceled in 1993 not long after it went under construction. The death of the Superconductor, while not a reactor research project, symbolized the lack of national interest in expensive physics research.

In conclusion, the flow of national historical events had begun to turn away from nuclear reactor research by 1970 -- with profound impacts on the INEEL. Its mission had to change. The historically significant "nuclear reactor testing" context ended in 1970.

Context V: Multi-Program Research: 1971-Present

Research continued after 1970, but it was clearly research of a different type than before. It was broad-based, going far afield from nuclear physics and nuclear chemistry into realms such as cosmology, genetic information coding, the geosphere, geothermal energy, ecosystem processes, mathematics, computing, and medicine. INEEL developed clients well beyond the Department of Energy.

Trying to conceptualize the post-1970 period brings into relief the National Register policy that history be allowed to unwrap itself for fifty years before historians jump to conclusions. This investigation has not found sufficient evidence to characterize the post-1970 context as "exceptionally significant."

Of all the post-1970 research at the NRTS, LOFT-related activities are more closely related to what had gone on before 1970. Therefore, LOFT buildings were inventoried as part of the "nuclear reactor research" context.

Context VI: Remediation of Waste: 1970-Present

The "cleanup" phase of the Nuclear Age carries the weight of a contextual period all its own. The Department of

Energy has been charged -- through legislation, judicial order, and internal commitment -- to remediate the Cold War "legacy" of contamination and waste left by nuclear weapons and reactor development. Resource expenditures at the INEEL in the 1990s were dominated by the prevention of waste, the cleanup of waste sites created in the past, and research into better ways of handling waste, eliminating waste, reducing waste, transporting waste, and transforming waste from one form into another. The name chosen for this context is "Remediation of Waste." (This name distinguishes remedial activity from the management, handling, and disposition of waste that was a normal part of operations at the INEEL since its establishment in 1949.)

The year 1970 is offered as the beginning of this period. Nationally, it was the first year of NEPA and the chain of events that followed. At the NRTS, 1970 was the year that NRTS decided to store nuclear waste from Rocky Flats, Colorado, above ground at the Radioactive Waste Management Complex (RWMC), the new name for the old NRTS "Burial Ground." This sparked another series of events leading to heavy federal investment in the remediation of the pits and trenches of the old burial ground and the construction of the first buildings at the RWMC in 1974.²⁶

All of the buildings at the RWMC were identified as part of this context. Several buildings at other INEEL activity areas were likewise identified. Certain waste research facilities overlap the previous context, but the inventory disposition makes little difference. It is premature to regard either context as historically significant, so the association of a facility with either context has no impact on the preservation recommendations.

²⁶ It should be noted that the volume of waste at INEEL is a small percentage of the total "legacy" of waste in the United States. The remediation of waste at the Hanford and Savannah River facilities is likely to outweigh the activities at INL in scale, scope, and historical impact. See Chapter 3, "Waste," in Department of Energy, *Linking Legacies* (Washington, D.C.: Office of Environmental Management, 1997), p. 31-71. For example, the INEEL holds only three percent of the total volume of high-level nuclear waste.

CONTEXT III: ORDNANCE TESTING, 1942-1949, 1968-1970SubTheme: *World War II*

INEEL Area: Navy Proving Ground/Central Facilities

Introduction: World War II Arrives in the Idaho Desert

Before World War II, the arid lands between Arco and Idaho Falls were used primarily for grazing. Earlier in the century, local irrigation companies had promised settlers water from the Big Lost River, but they failed to deliver it. Disappointed homesteaders relinquished their lands. A few traces of human habitation and enterprise remained on the landscape -- the banks of abandoned canals, foundations of former homes and farm buildings, and a few non-native plantings. A new demand for these isolated lands, most of them still in the public domain, arose when the United States entered World War II.

When Nazi Germany invaded Austria in 1938, the U.S. Congress authorized the U.S. Navy to expand its ship and aircraft strength. The Navy built large air bases on the east and west coasts and on the islands of Hawaii and Guam. The Navy also strengthened its support facilities, especially for the West Coast bases, where these were minimally adequate. After Japan attacked the U.S. fleet and air bases at Pearl Harbor, the pace quickened dramatically as the country went to war. The Navy searched everywhere for new locations to accommodate further expansion. Because of wartime shortages of materials and manpower, construction rules specified that new buildings should be basic and strictly functional, without elaboration or unnecessary enhancements. Substitutes were to be sought for scarce materials.¹

As the war in the Pacific intensified, so did the demand for military support of all kinds: training, ordnance and ordnance testing, gun repair, and research related to safety. The coastal cities had supplied all the facilities and labor that they could, so the Navy looked inland for suitable locations. Congress appropriated funds, and Navy projects were established in several western states. The Sixth Supplemental National Defense

¹ United States, *Building the Navy's Bases in World War II: History of the Bureau of Yards and Docks and the Civil Engineer. Corps, 1940-1946*, Vol. 1 (Government Printing Office: Washington, D.C., 1947), p. 1-13. Hereafter cited as "Building the Navy's Bases."

Appropriation Act of 1942 placed two facilities in Idaho. One was a large personnel training base, Farragut Naval Training Center, at Lake Pend Oreille in north Idaho. The other was the Naval Ordnance Plant at Pocatello, established on April 1, 1942.²

The Pocatello Naval Ordnance Plant

The mission of the Pocatello plant was to manufacture, repair, and assemble large-caliber naval guns, mounts, and related equipment required for the Navy's Pacific battleships. A key activity was the relining of major-caliber battleship guns sent to the plant after repeated firings in battle had worn out the rifling in the guns.

The Pocatello site met all the selection criteria. It consisted of 211 acres located three miles north of the town. It was inland and east of the coastal mountain ranges, so it was both isolated and secure. The area contained a plentiful labor supply and space for expansion. The land was marginal for farming and, therefore, less expensive than other potential sites. Ample water was available. Most important, the site was situated near one of the largest Union Pacific railroad terminals in the United States. A transcontinental highway also passed through Pocatello. The plant could easily take delivery of steel, chemicals, ordnance, personnel, and battleship guns shipped from the West Coast.³

The plant, built by the Idaho-based Morrison-Knudsen Company, contained large and small gun shops, ordnance storehouses, personnel quarters, machine and proof shops and accessory buildings. While spacious, the Pocatello site lacked one necessary asset: a location nearby to proof-fire the relined guns before declaring them ready to return to the coast and remounting on battleships. The Navy first considered a site near Tabor, Idaho, about forty miles northwest of Pocatello but found the land too uneven and access limited.

The Navy looked further north toward the Arco Desert and found an ideal site. The land was flat, arid, and sparsely

² *Building the Navy's Bases*, p. 16-44; 351.

³ *Building the Navy's Bases*, p. 341; see also Julie B. Braun, *Lockheed Idaho Technologies Company Internal Report, INEL Historic Building Inventory Survey, Phase I* (Idaho Falls: Sept. 1995), p. 29-30. Hereafter cited as "Braun, Inventory Phase 1."

populated. A few acres were in private hands, but most of the land was in the public domain. The Navy appropriated about 271 square miles, configured up to nine miles wide and thirty-six miles long at its extreme dimensions. A branch of the Union Pacific Railroad passed near the southern edge of the site on its way from Pocatello to the towns of Arco and Mackay. By building a short spur line, the rails could carry the guns and other traffic between Pocatello and the proving ground -- a distance of about sixty-five miles. The Morrison-Knudsen Company built all the buildings at the site. J.A. Terteling Company, another Idaho construction company, did subcontract work there and at the Pocatello plant. The proving ground was finished by August 1943.⁴

The Arco Naval Proving Grounds (NPG): 1942-1949

The Arco Naval Proving Grounds facilities were divided into two areas: the Proof Area and the Residential Area. The Proof Area was the business end of the site, equipped to test-fire the guns relined or manufactured at the Pocatello plant, noting their accuracy and consistency. Later during the war the spacious expanse of the desert was the scene of additional missions -- bombing target practice, research on the safe design of explosives storage cells, and miscellaneous research on new forms of explosives.

The buildings and structures in the fenced and guarded eighty-five-acre Proof Area included a bank of ten gun emplacements, a concussion wall, control tower, an office building east of the control tower, the tool room and oil storage tanks west of the control tower, a nearby restroom, five munitions magazines, two electric substations, guardhouse, pumphouse, and two temporary buildings. Railroad trackage supported the movement of guns and equipment around the area. Most of the structures were constructed of reinforced concrete to withstand blast and vibration from proof testing and potential munitions explosions.

The concussion wall, 315 feet long, 15 1/2 feet high, and 8

⁴ Information on M-K and Terteling companies from "Appendix B," *Interim Ordnance Cleanup Program Record Search Report for the Interim Action to Clean Up Unexploded Ordnance Locations at the Idaho National Engineering Laboratory* (Idaho Falls: Wyle Laboratories, Scientific Services and Systems Group, Norco, California, for Sciencetech, Inc., January, 1993). Hereafter cited as "Sciencetech Report."

feet thick, was reinforced with double rebar placed in a close eight-inch grid. The railroad siding near the gun emplacements was equipped with a 250-ton gantry crane to remove guns arriving from Pocatello. A gun ready to be proofed was positioned on one of the ten emplacements, loaded with a charge, and fired northward. Test operators located within the building behind the concussion wall could observe the firing through narrow window slits. Downrange, spotters were positioned at observation towers and in communication with the control tower. Aided by rows of marked concrete monuments across the desert, they triangulated the location of impact and recorded the performance of the gun.⁵

Munitions magazines, also located near railroad trackage, were constructed completely of reinforced concrete. They either had earthen berms on the side walls or were built below-ground with berms covering the entire building except for the entrance.

The Residential Area supported the Navy, Marine, and civilian personnel who lived and worked at the site -- including Women Ordnance Workers, or "WOWs." It contained civilian and officers' houses, associated garages, enlisted personnel barracks, (patrol) dog kennels, a warehouse, commissary, paint house, water tower, deep wells, sanitary sewers, fences, and electrical distribution lines. In 1944 a combination garage, fire station, and locomotive shed was added. On twice-weekly movie nights, the residents moved the locomotive outside, set up a movie projector, and settled down on rows of benches to enjoy the show.⁶

The Residential Area was divided into two complexes, separated by the railroad spur coming in from the Union Pacific branch. The civilian complex was on the south side and consisted of single-family dwellings. They were situated close to one another in an oval, with a circular roadway located on the outer edge and driveways leading to each house. The homes were wood frame, probably of prefabricated materials, and had lawns and fenced gardens.⁷

⁵ Margaret and Orville Larsen, interview with Susan M. Stacy, March 19, 1999. For a fuller account of life and operations at the Naval Proving Ground, see Chapter 2, "The Naval Proving Ground," in Stacy, *Proving the Principle*.

⁶ Stan Coloff, "The High and Dry Navy: World War II," *Philtron* (October 1965), p. 3; Stacy, *Proving the Principle*, p. 11, 12. Hereafter cited as "Coloff."

⁷ A 1951 photograph shows most of these buildings: INEEL negative number 02974.

The officers' houses and the Marine barracks were on the north side of the spur tracks. These buildings were sided with brick veneer and had shutters around the windows. The lawns were landscaped with substantial plantings of trees and shrubs. The base commander's residence (later known as CFA-607) had its own matching garage. The barracks was of similar construction and housed approximately twenty Marines. Among other duties, the Marines -- and their dogs -- patrolled the site perimeter. The kennels were near the barracks.⁸

Within a very short time, the Navy had shaped the desert landscape to accommodate its mission. A road system, water lines, sewer lines, electrical and telephone lines, and the railroad track united the Residential and Proof areas. The Navy named the main roads Lincoln Boulevard, Farragut Avenue, and Portland Avenue -- names that continue in use today. The railroad siding and village was (and still is) called Scoville after John H. Scoville, the Officer in Charge of Construction at the Pocatello plant and the proving ground.

Research and Testing Programs at Arco NPG: 1942-1949

Although a small facility, the Arco NPG was one of only six specialized facilities conducting ordnance experiments during World War II. One of the largest ammunition depots in the United States already existed at Hawthorne, Nevada, but no testing was performed there. Each ordnance testing facility specialized in various types of ordnance. The White Oak, Maryland, site tested underwater mines. At Stump Neck, Maryland, powder testing was the emphasis. The Montauk, New York, site specialized in torpedoes. In 1943 (after the Pocatello plant was constructed) a rocket ordnance test station was established in the Mojave Desert at Inyokern, California. In 1944 the Shumaker, Arkansas, site began large-scale production of rockets.⁹

At Arco, the specialty, but not the only one, was the proof firing of the Navy's 16-inch ship guns. In addition, proof-testing was done on lesser-caliber anti-aircraft guns, aiming them high into the air. Between 1942 and 1945, the Arco NPG test fired 1,650 gun barrels, large and small.¹⁰

⁸ Coloff, p. 3.

⁹ *Building the Navy's Bases*, p. 339-340, 351-354.

¹⁰ Braun, *Inventory Phase 1*, p. 31-32; and *Sciencetech Report*,

The Navy permitted certain U.S. Army activities at the site. Bomb groups and fighter squadrons training at the Pocatello Army Air Base used two areas of the proving ground to practice day and night high-altitude bombing techniques. B-24 Liberator bombers dropped 100-pound sand-filled bombs equipped with black powder spotting charges. The pilots aimed at wooden pyramid targets.¹¹

Other areas were used for safety-related detonation research. The Joint Army/Navy Ammunition Storage Board authorized demolition tests to determine safe distances between high explosive munitions magazines. The research questions concerned how best to store explosive shells and cartridges in transit and at docks and depots. Army chemists built test storage cells and bunkers in the desert, packed them with TNT to simulate an actual storage facility, and ignited nearby "accidental" charges. The tests helped the scientists combine concrete barriers with air gaps in designs that would help protect the contents of nearby ammo cells. A test conducted in 1945 exploded 250,000 pounds of TNT stored in an igloo-type storage bunker, incidentally creating a crater fifteen feet deep and a noise heard all the way to Salt Lake City.¹²

Smokeless powder tests were conducted in 1944 and 1945. The tests helped determine whether confinement in a standard reinforced concrete magazine would cause the powder in them to explode, rather than burn. One of the concrete bunkers located near the concussion wall stored the powder in quantities of 500,000 pounds until it was tested.

The researchers tested new types of illuminated projectiles (also called "star shells") and white phosphorus projectiles to determine detonation characteristics. Mass detonation of projectiles took place in 1945. The ammunition was shipped to the Arco site from the depot at Hawthorne, Nevada.

After World War II ended, explosives research continued at the proving grounds. Varying quantities of conventional

p. 2-6, 2-7.

¹¹ One area was located five miles northwest of INL's Radioactive Waste Management Complex; the other, centered on today's Highway 20 between East Butte and the site of Argonne West. See *Sciencetech Report*, Reference 96, p. 2-74, 6-7.

¹² See *Sciencetech Report*, Table 2-1, p. 207.

explosives were used on numerous structures and materials. The tests continue to advance the safety standards for storing large quantities of explosive materials. The largest powder explosion of the time took place at the site on August 29, 1945. Similar tests continued into 1946.¹³

By 1947, gun proofing activities at the site had significantly diminished. The proving ground absorbed new functions. After the war, naval vessels were decommissioned, and various equipment from the ships were sent inland for repair and storage. Pocatello received much of that material, and some of the abundance -- nets, floats, mooring rings, buoys -- went for temporary storage to the proving ground awaiting sandblasting and repainting. The NPG was designated a depot stockpiling surplus manganese for the U.S. Treasury.

The research that continued went along at a slower pace than before and no longer in connection with the gun plant in Pocatello. Some 1948 and 1949 research was classified, the details generally unknown today. "Project Marsh" may have been an effort to develop countermeasures for guided missiles. "Project Elsie" may have tested 16-inch shells made with depleted uranium.¹⁴

The Atomic Energy Commission Acquires the NPG, 1949

Congress created the Atomic Energy Commission (AEC) in 1946 to develop nuclear energy for peaceful purposes under civilian authority. After evaluating several locations, the AEC selected the Arco NPG in 1949 as the site for a nuclear reactor testing station. The Navy reluctantly gave up the proving ground and its buildings to the AEC.¹⁵

The houses, warehouse, rail trackage, and the accompanying infrastructure of the Residential and Proof areas became very useful to the AEC as it began to build the country's first and only National Reactor Testing Station (NRTS). This area became

¹³ Sciencetech Report, p. 59-71.

¹⁴ Sciencetech Report, p. 72-73.

¹⁵ Richard Hewlett and Frances Duncan, *Atomic Shield, 1947-1952: Volume II of a History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1969), p. 210.

the nucleus of what later became known as the Central Facilities Area (CFA). Houses became offices and ad hoc laboratories, storage areas continued to serve construction contractors, and new buildings quickly enlarged the site.

The gun emplacements and concussion wall outlived their function. These assets were not reused, but left in place.

SubTheme: Vietnam War

INEEL Area: Navy Proving Ground/Central Facilities

Vietnam War Ordnance Testing

The Vietnam War revitalized several mothballed ordnance facilities across the United States. The Pocatello Naval Ordnance Plant resumed its work relining 16-inch guns for the USS New Jersey -- a battleship sent for special duty in Vietnam. The guns were reworked to extend their range. The Navy used the ship to clear (from off-shore) 200-yard-diameter landing zones in Vietnam's heavily canopied jungles.¹⁶

In 1968 a new Naval Ordnance Test Facility (NOTF) was constructed at the NRTS. Because nuclear reactors and their associated buildings and structures now occupied the old bombing and gun ranges, the original swath of desert north of CFA could not be used. Guns would have to point south. The Navy built a new gun emplacement northeast of Experimental Breeder Reactor-I, along with a new access road, railroad spur, firing pit, pivot point, concussion wall, and equipment shelter. It moved the NPG gantry crane from its original location to NOTF, where it once more unloaded heavy guns for proof testing. The target was the northern flank of Big Southern Butte.¹⁷

Proof-firing at the NRTS ceased in 1970, before the end of the war. The Indian Head Ordnance Station in Maryland expanded and took over this role for the USS New Jersey and other major battleships.

Most NOTF structures have since been removed from the site except for one gun emplacement and parts of the concussion wall.

¹⁶ Norman Friedman, *The Naval Institute Guide to World Naval Weapons Systems, 1991/92* (Annapolis, Maryland: United States Naval Institute, 1991), p. 457.

¹⁷ Stacy, *Proving the Principle*, p. 17.

These are now ruins. The gantry crane returned to its original location at the Central Facilities Area. Impact craters from NOTF gun proofing are still visible on Southern Butte's north-facing flank.¹⁸

Extant NPG Buildings

Several Arco NPG buildings and structures are extant. The Proof Area retains railroad trackage, parts of the bank of gun emplacements, the concussion wall and the operations building directly behind it, at least one ammo storage bunker, a pumphouse, and the gantry crane.

In the Residential Area, the civilian houses were removed to make way for new requirements of the CFA as the NRTS grew and expanded. Several examples of the red-brick Navy personnel housing remain, including the Marine barracks, officers' quarters, the commanding officer's house, and a garage. Lincoln, Farragut, and Portland roads continue in use.

Significance of the NPG and Recommendations

As one of six specialized ordnance facilities that conducted research and experiments during World War II, the NPG was a fairly rare military feature on the Home Front. Victory in the Pacific theater relied partly on the performance of battleship guns. The NPG was the terminus of an elaborate logistical system that began with the guns on ships like *USS Missouri* and *USS Wisconsin*. After repeated combat firing wore out the rifling, the guns were shipped to the coast, sent by rail overland to Pocatello, relined, sent to the proving ground, test-fired, and scored for accuracy. The guns then returned to action the way they had come and entered battle once more. Aside from being a tribute to the logistical excellence of the U.S. military, the NPG's association with the great battleships of the war and with military research are important national historic themes.

The NPG is one of very few sites in Idaho that might interpret for future generations what the state contributed to American victory in the Pacific during World War II. Likewise, it

¹⁸ Braun, *Inventory Phase 1*, 37; INEEL photos 68-1808, 68-2408, 68-2412, and 68-2866 at the INEEL Photo Archive; Brandon Loomis, "Blast Site--INEL Officials 'Cleaning Up' Land Mines," *Idaho Falls Post Register*, from clipping file with no date.

retains a few remnants of a unique "village" of civilians and military personnel arranged for domestic life amidst the firing of battleship guns, bombing practice, and the detonation of vast stores of TNT.

The NPG also provided the core setting for the present-day INEEL. Infrastructure such as roads and rail sidings influenced the location of later facilities. Beyond the proofing and residential centers, the NPG had altered the desert landscape. Explosives tests and gun firings had produced impact craters and left a variety of ruins on the desert floor -- piles of shattered concrete and twisted metal, bomb shells and even unexploded projectiles. The latter was sometimes observed being "initiated by desert heat," a hazardous legacy that remained unattended until many decades later.¹⁹

In 1992 INEEL contracted with Wyle Laboratories of Norco, California, to clear the desert of explosive debris and scrap metal. Since then, over 1,500 explosive ordnance items have been destroyed and 120,000 pounds of scrap metal cleaned up.²⁰

For its many thematic associations, the World War II "Ordnance Testing" context is assessed as historically significant. A HABS/HAER-level document ought to gather together archival resources such as historic photographs, plans, oral histories, military correspondence and research reports. Material published as Chapter 2 in *Proving the Principle* is an additional source of interpretation and context that could supplement the HABS/HAER report and be reprinted for public distribution.

Historic preservation planning at INEEL should preserve the Proof Area in place, aiming to protect it from further decay or destruction. Plans for the Residential Area should continue to reuse and preserve the NPG-era buildings.

The role of ordnance testing at NOTF for the Vietnam War was considerably less important to the prosecution of that war than the previous testing during World War II. Likewise, the impact of this activity on the course of Idaho history was relatively minor. The equipment shelter is not extant. Unless the remaining ruins have retrospective value in interpreting WW II activities, they are not assessed as historically or exceptionally significant in the Vietnam War era of "Ordnance Testing."

¹⁹ Scientech Report, Reference 92.

²⁰ Scientech Report, see also Loomis, cited in Note 18 above.